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Case report

Anthrax in a Scottish intravenous drug user

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ABSTRACT

Anthrax, caused by *Bacillus anthracis*, is an uncommon disease in the United Kingdom. In December 2009, the first recorded case of injectable anthrax in the UK was diagnosed in Glasgow, Scotland. This case report describes the disease presentation in a detained person in police custody in Dumfries, South West Scotland. The case highlights to forensic physicians the clinical features of anthrax, particularly in relation to intravenous drug misuse and the importance of early recognition. Anthrax and its presence in the UK is discussed.

1. Introduction

On 17 December 2009, anthrax was diagnosed in an intravenous drug user, who subsequently died in Glasgow, Scotland. In February 2010 the disease had spread 60 miles south to Dumfries and Galloway after 28 more cases had been diagnosed in Scotland including 10 further deaths.[1] The following case occurred in a detained person (DP) in police custody and was the second to be diagnosed in Dumfries, days after the first was diagnosed (now totalling 5).

2. The case

A 23 year old man was detained on a warrant on 27th Feb 2010. The following day the duty forensic physician was asked to examine the DP who was complaining of a sore knee following an injury sustained while running away from the police. The DP admitted to injecting heroin on a regular basis. On examination the DP had a normal pulse, blood pressure and temperature. During routine examination of his injection sites, it was noted that his left forearm was uniformly swollen throughout from just above the elbow to the wrist and with a little swelling of the hand and fingers. The skin colour was normal with no significant erythema. Both forearms were equal in temperature to touch and both had equal radial pulses. There was a subjective feeling of numbness in the forearm. On closer questioning the DP admitted to last injecting his left arm 2 days before and that it started to swell the following day. However he had no concern since it was not painful, there was no redness and he felt well. He said he couldn't feel anything since it felt numb, as he duly demonstrated by knocking his arm against a wall.

Following full examination the main concern was the swollen forearm. It was unusual since there were no focal areas of redness nor swelling as usually seen with skin popping with superadded infection. There was no pain. Consideration was given to causes other than cellulitis such as deep vein thrombosis of the limb but there was no swelling above the elbow to suggest this. The author did give consideration to starting oral antibiotics in police custody on the assumption this was an infective cause and the DP felt well. However, due mainly to the oddness of the swelling and the publicity of recent anthrax cases the DP was admitted to the local hospital, specifically with this concern. The DP was told of this concern as well, and replied after a thoughtful pause "I never thought of that", despite press publicity around the town and also talk amongst drug users following the first case a few days before.

The DP was admitted and treated as per a possible case of anthrax based on the clinical findings and the epidemiological link. Subsequent tests confirmed anthrax (growth of *B. anthracis*, evidence of *B. anthracis* DNA on PCR, presence of specific anthrax toxin in blood or serology with seroconversion).

3. Background

Anthrax, a zoonosis, is the name given to the acute infectious disease caused by the spore forming vegetative bacterium *B. anthracis*, a non motile Gram +ve rod shaped organism. The bacillus belongs to the same group of bacilli as *Bacillus cereus*, renowned for

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causing vomiting following inadequate reheating of a Chinese takeaway rice. It is a naturally occurring soil organism found mainly in Asia and Africa. It infects herbivores, mainly hoofed animals such as goats, cattle and sheep usually following ingestion of the spores. It is invariably fatal in these animals as a result of germination of the dormant spores following phagocytosis by macrophages, releasing the bacilli into the system followed by the production of many lethal toxins culminating in multiorgan failure. The animal often suddenly falls to the ground and dies, with resultant haemorrhage and seepage of secretions, further distributing the spores into soil. The spores are very resilient and can exist in soil or on contaminated products for many years. In the UK the last 2 cases affecting livestock were recorded in 2000 at a farm in Wales. This was felt to be due to a ground source since the same farm had affected cattle 35 years before. It is a rare disease in the UK and it is even rarer for someone to die from it. In a comprehensive review article on anthrax in 1999 the authors stated that none of them had ever seen a case.[2] There have been no reported cases of human–human transmission.

4. Clinical features of anthrax in humans[2,3]

Human infection occurs by contact with spores through several different routes, namely cutaneous, pulmonary or inhalation, gastrointestinal, meningeal and now injectable. However in general man appears to be highly resistant to infection with anthrax spores.

Cutaneous anthrax is by far the commonest form of the disease and certainly the majority of cases historically in the UK in humans are cutaneous. This typically occurred as a result of occupational exposure from animals or animal products in the wool industry or slaughterhouses in the 1950–60's and the skin lesions adopted the name "woolsorter's disease". These can start as a small pimple, but rapidly progress to become 2–3 cm in diameter with a coal-black centre or eschar (anthrax, from the Greek for coal) surrounded by cutaneous swelling, commonly known as a "malignant pustule". However no pus is usually evident unless there is a secondary bacterial infection. Swelling can be quite considerable resulting in compressive symptoms depending on the site involved. 95% of cutaneous cases clear with simple antibiotic treatment and some cases may even resolve with no treatment. 5% can progress and become fatal.[4]

The rarer pulmonary anthrax, however, is a more serious disease with a high mortality of nearly 100% and is usually responsible for the reported deaths in humans. Nasal swabs from workers in the occupations described earlier have confirmed the presence of anthrax spores suggesting exposure to high levels during the course of their work. Interestingly however only very few would develop inhalational anthrax for reasons that remain unclear. The disease usually results in a haemorrhagic mediastinitis (causing a classical X-ray appearance of a wide mediastinum) progressing to septicaemia, respiratory distress syndrome and ultimately death. To date there appears to have been no cases reported of inhalational anthrax from drug users smoking heroin but this remains a possible risk.

Gastrointestinal anthrax occurs following ingestion of spores through contaminated food. The disease affects the gastrointestinal tract causing haemorrhage, septicaemia, intestinal perforation and death. It is rare with a high mortality. Anthrax meningitis is usually a complication of systemic anthrax and usually unsurvivable.

Injectable anthrax appears to be a newer form of the disease. The only other recorded case of injectable anthrax came from Oslo, Norway in 2000.[5] This coincided with a spate of deaths, again amongst Scottish intravenous drug users in 2000 which killed 11. Results however did not conclusively reveal anthrax despite extensive tests and the cause of contamination remained uncertain.[6]

5. Recent history

Perhaps in Scotland, anthrax is best known for its association with chemical warfare testing on Gruinard island in 1942 during World War 2, over concerns that the Germans were developing similar weapons. This small Scottish island in Gruinard Bay, off the north western coast was used as a testing site for anthrax. Bombs containing spores were dropped over sheep contained in a field. The sheep died 2–3 days later. The site and island were then kept quarantined for the next 44 years until the Government in 1986 decided to decontaminate the area. Top soil was removed from the 520 acre island after the surface had been soaked with 280 tonnes of formaldehyde diluted in 2000 tonnes of seawater. In 1990 the site was deemed decontaminated and safe. However concerns have still been expressed, particularly by Scottish archaeologists who uncovered anthrax spores during an excavation of a medieval hospital near Edinburgh, felt to be hundreds of years old.[7]

In the US, anthrax came to attention during the biological chemical attacks in 2000 where 17 people were affected and 5 died. Concern was initially centred over a possible terrorist attack but the Federal Bureau of Investigation subsequently traced the source to a specific flask from one of its own biological research centres, after testing over 1070 samples of anthrax from 18 laboratories (the *Bacillus* had specific genomes and mutations and so could be traced back to one source). Subsequently the chief suspect, who allegedly posted the anthrax spores in letters and who worked at the US Army Medical Research Institute for Infectious Diseases, committed suicide and the ongoing case against him collapsed.[8]

Since 1981 there have been only 19 confirmed cases of human anthrax in the UK, most of which have been cutaneous, the last death being over 30 years earlier.[9] In 2006, a 50 year old drum maker from Hawick, Scotland, died from pulmonary anthrax following likely inhalation of spores. The man concerned had been handling untreated hides imported from West Africa used in the making of drums. In 2008 another 35 year old drum maker and musician from London died after developing pulmonary anthrax, again from handling imported animal hides. Then in December 2009 the first case of injectable anthrax was reported from Glasgow, which was the first of 28 cases reported in Scotland at the time of writing. There have been 3 confirmed cases reported to date in England, the first in Blackpool where the person died and the other 2 in London.[10] In Europe there has been one reported death in Germany.[10] In Scotland 10 cases have resulted in death. It is still not known where the original source of anthrax spores came from but it is likely to be either from soil contamination during the production process of heroin thought to be in Afghanistan, or from the cutting material used in the UK. Bone meal used in cutting material has been suggested as a possible source but there is nothing so far to suggest this, nor is there any evidence to suggest deliberate contamination. Tests have shown that the victim from Aachen, Germany had injected the same strain of anthrax as in the Scottish cases.[11] This would suggest that the spores came from the same single source and that contamination occurred most likely before the heroin was distributed.

6. Forensic perspective

In police custody, forensic physicians need to be extra vigilant when examining a DP who injects drugs. Injection sites need to be visualised since often the DP will not complain of any discomfort. Abnormal degrees of painless non pitting oedema should alert the examining doctor to possible anthrax. Following the small number of cases in Scotland to date, certain common clinical features have been found to be of significance[1]:

1. Skin and soft tissue - significant oedema which may be out of proportion to the injection site or cellulitis. Oedema may be the only feature as in the case described. The classic "malignant pustule" is not usually seen.
2. There may be little or no pain
3. Abscesses may be absent
4. Initially the person may be well with normal observations and no fever (CRP and WCC may well be normal at first)
5. Rapid progression of soft tissue signs requiring prompt intravenous antibiotics and surgical debridement of the affected area.

Locally arrangements have now been implemented for intravenous users to access drug clinics within 24 hours with view to commencing methadone maintenance treatment in attempt to halt the spread of anthrax.

7. Conclusion

Anthrax has been around for many centuries and was described by the Ancient Romans.[12] Up until December 2009 it was a rare disease in the UK and it was even rarer to die from it. However injectable anthrax has now emerged in Scotland and is affecting intravenous drug addicts resulting in death in a significant proportion. Rapid diagnosis and treatment is essential to minimise the risk of progression and death. Since the writing of this case, the author has seen another confirmed case of anthrax in an intravenous drug user who presented with painless swelling in his groin.

Forensic physicians need to be aware of the existence of anthrax since, even though it is rare, it does occur and new cases are still being diagnosed amongst drug users, both in Scotland and England. To date there have been no deaths in Dumfries and Galloway which may reflect the new awareness of doctors and healthcare professionals following the earlier deaths in Glasgow. The subject in the case described has retained his arm and is recovering well, thanks to early intervention.

Conflict of interest

There are no known conflicts of interest.

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Ethical approval

None.

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